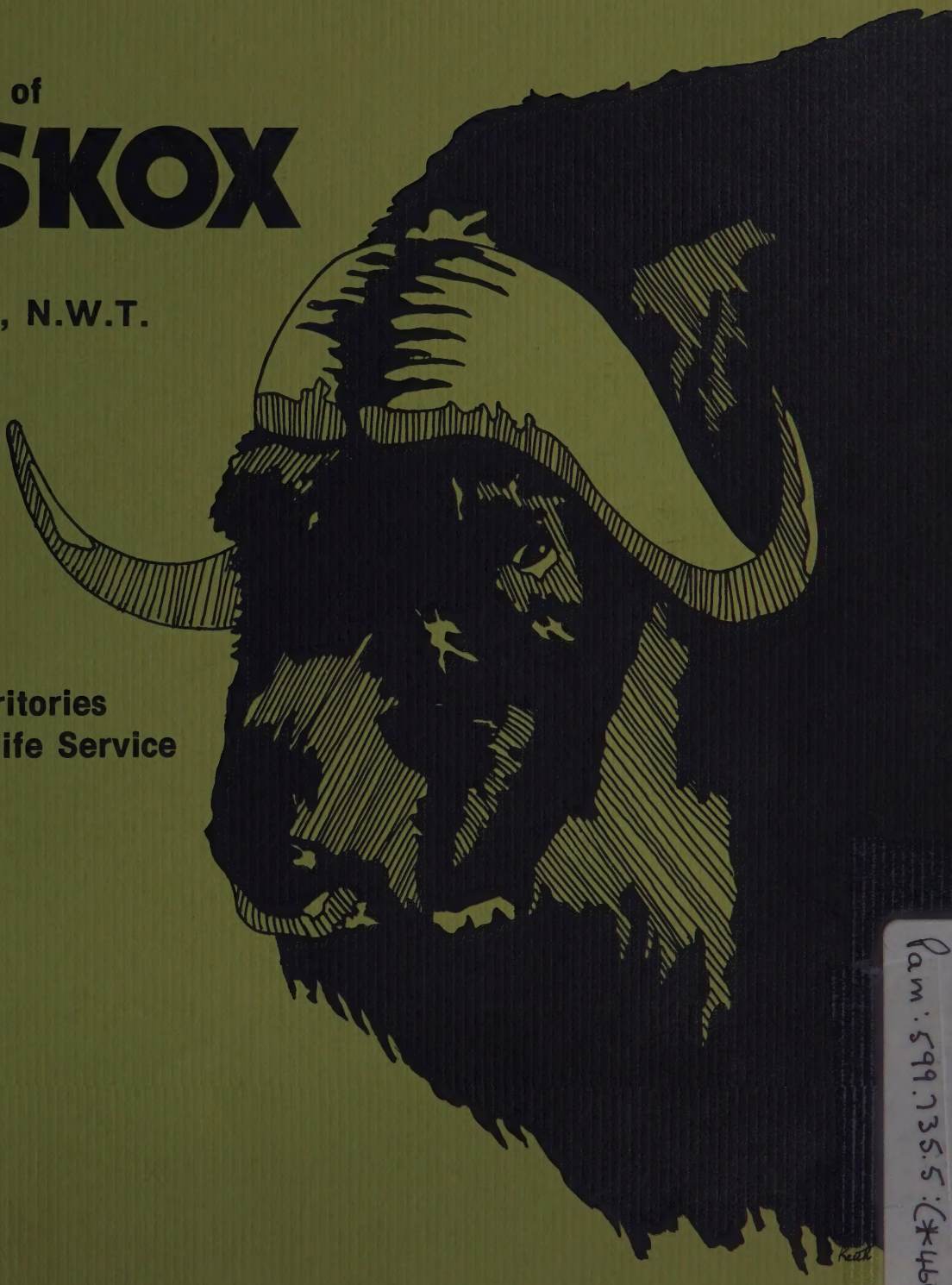
Aerial Surveys of

MUSKOX

Baily Point,
Melville Island, N.W.T.



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ON
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NORTHWEST TERRITORIES

FEBRUARY AND MARCH, 1976

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for

Northwest Territories Fish and Wildlife Service

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Waterton Park, Alberta
May 17, 1976

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Introduction

During February and March of 1976 a study was planned to determine the possible effects of seismic activity on muskox at Bailey Point, Melville Island where muskox are numerous. The co-operating parties were:

1. Fish and Wildlife Service, Government of the Northwest Territories, Yellowknife.
2. Land Use Section, Department of Indian Affairs and Northern Development, Ottawa.
3. Land Use Section, Northwest Lands and Forests, Department of Indian Affairs and Northern Development, Yellowknife.
4. Beak Consultants for Panarctic Oils Limited, Calgary, Alberta.
5. Canadian Wildlife Service, Department of Environment, Edmonton, Alberta.

Panarctic Oils Limited made application to shoot about 380 miles (611 km) of seismic, approximately one third of which was on or near an area known to support a dense muskox population. (Miller et al 1973,1974; Thomas et al 1975.)

The study plan included three phases to be carried out by biologists of the Fish and Wildlife Service and Beak Consultants Limited.

Phase 1. An aerial survey of the area prior to seismic activity

was to be flown to determine the number of muskox, their distribution, and herd sizes.

Phase 2. A field study was planned which would use the seismic camp facilities as the base of operation. Data were to be collected on the behavior of muskox near seismic operations (experimental) and also herds at least 10 miles (16 km) distant from seismic operations (control). These data were hoped to provide behavior patterns of disturbed and undisturbed animals, as well as direct overt reaction to seismic activities. If feasible, an aerial survey was to be conducted during seismic activity.

Phase 3. An aerial survey was to be conducted immediately after exploration stopped to determine if the number, distribution and herd sizes of muskox had changed during the period of seismic activity.

Problems with terrain and weather caused Panarctic to cancel the seismic program for Bailey Point. Therefore Phase 2 of the study was also cancelled. Phase 3 was carried out, as though seismic activity had taken place, to provide comparative data on possible changes of undisturbed muskox during that time period.

This is a report of the two aerial surveys of muskox on Bailey Point.

Study Area

Melville Island (75° 30' N., 111° 00' W.) is the largest (16,300 square miles or 42,220 km^2) of the western Queen Elizabeth Islands, Northwest Territories. Bailey Point, (is 288.4 square miles [747.0 km^2] in size) on the southwestern portion of the island lying between Hardy Bay

and the western arm of Murray Inlet, is 288.4 square miles (747.0 km^2).

The relief varies from coastal and river valley lowlands of less than 500 feet (152 m) elevation in the southern part of the peninsula to ridged highlands up to 2450 feel (747 m) elevation in the northern portion. From preliminary observations made during the summer season, the lowlands contain some of the most extensive sedge meadows on Melville Island. (Miller and Russell Pers. Comm.)

Method

On February 16 an aerial survey in a Twin Otter was conducted over Bailey Point. Observers were John Russell and Tom Chowns, Fish and Wildlife Service, Rene Pelkman and John Riley of Land Use Section, Northwest Lands and Forests, Dan Carruthers and Kent Brown of Beak Consultants Limited, Calgary, Alberta, and Pilots Bruce McManus and Bill Lauzon of Bradley Air Service, Resolute Bay, Northwest Territories.

Eight transects (transects 1 to 8 as shown in Figure 1) were flown in a north and south direction 2 miles (3.2 km) apart and 1000 feet (305 m) above ground level (agl). The pilots reported the number of muskox which passed directly under the plane. Transect width was 1 mile (1.6 km) on each side of the plane and coverage was 100%.

Transect width was determined by a marker placed on the strut. The marker was located by use of triangulation and checked by mapped landmarks which should fall in the outer edge of the transect strip.

Possible sources of error affecting survey results are as follows: (1) poor navigation, resulting in overlapping and or separated transects; (2) deviation in constant elevation above ground level, resulting

in changes in transect width; (3) yawing, which would also result in changes in transect width; and (4) displacement of disturbed muskox, causing the muskox to move onto unsurveyed areas or transects that had already been surveyed.

Due to thick ice fog and failing light 4.2% of the study area was not surveyed. (Therefore calculations of density were made using the 276.4 square miles or 715.9 km^2 actually surveyed.) Some muskox were likely missed there as the transects pass over river valley lowlands.

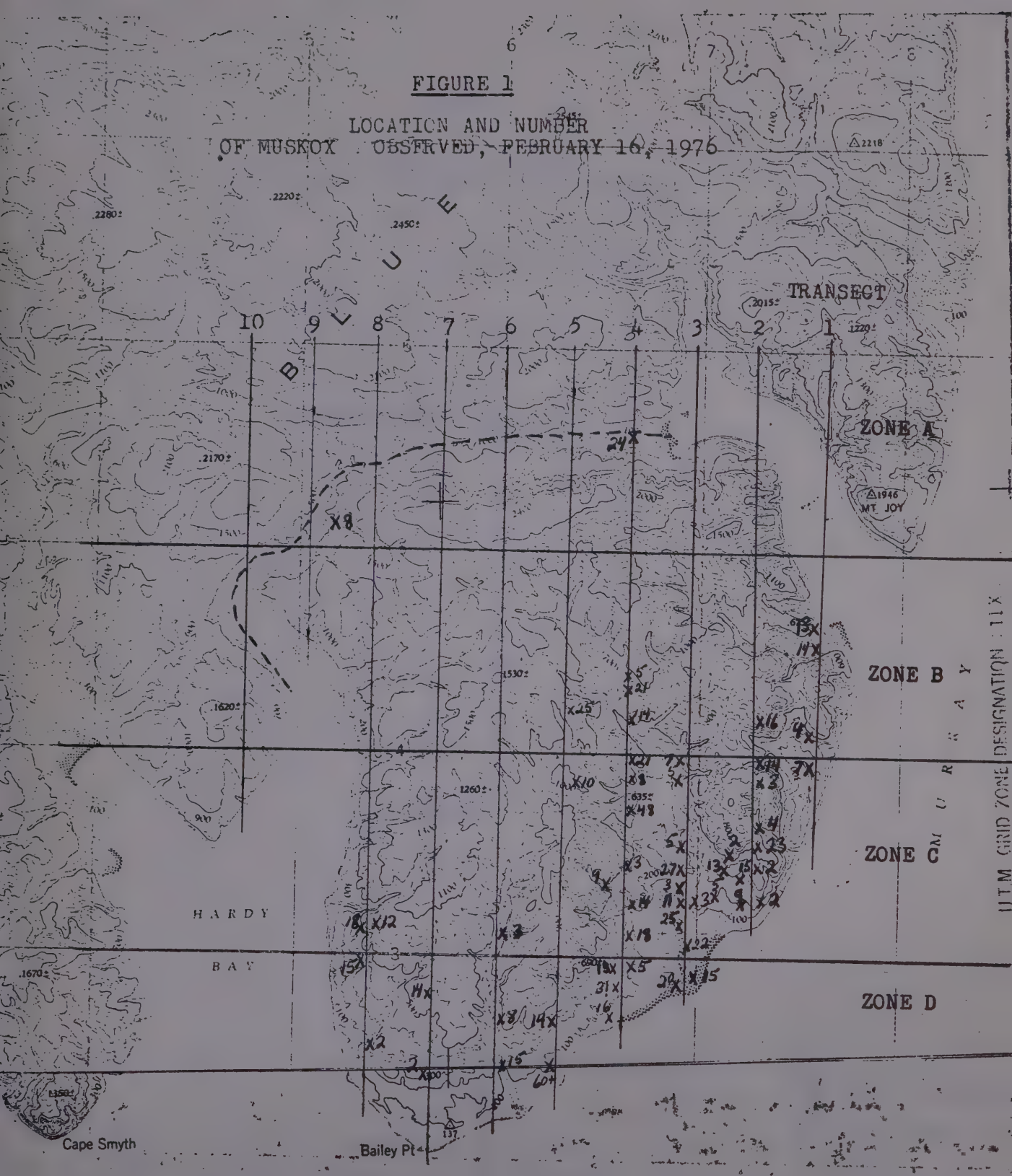
On March 28, a second aerial survey was carried out with a Twin Otter. Observers were John Russell, Rene Pelkman, Ken Brown, Doug Larson (Beak Consultants), and pilots Sean O'Brian and Gordon Montgomery both of Bradley Air Service. Survey methods were similar to the first survey, except the altitude was 1500 feet (451 m) agl because of better visibility and less disturbance to the muskox. The six miles (9.7 km) of transects (i.e. transects 9 and 10) missed during the first survey were completed on this survey, thus the entire study area was covered.

To determine changes of distribution, the study area was divided: Four north-south zones were plotted (Figure 1) and labelled A, B, C, and D from north to south; three east-west areas were designated I, II, and III (Figure 2).

RESULTS AND DISCUSSION

Distributions and Numbers

On February 16, 138.2 miles (222.4 km) were flown, covering an area of 276.4 square miles (715.9 km^2). A total of 745 muskox were counted in 56 herds. On March 28, 666 were counted in 51 herds in the same transects,



February 16, 1976
745 total
56 - No. of herds
13.3 - av. herd size
13 - median
1000 ft. agl

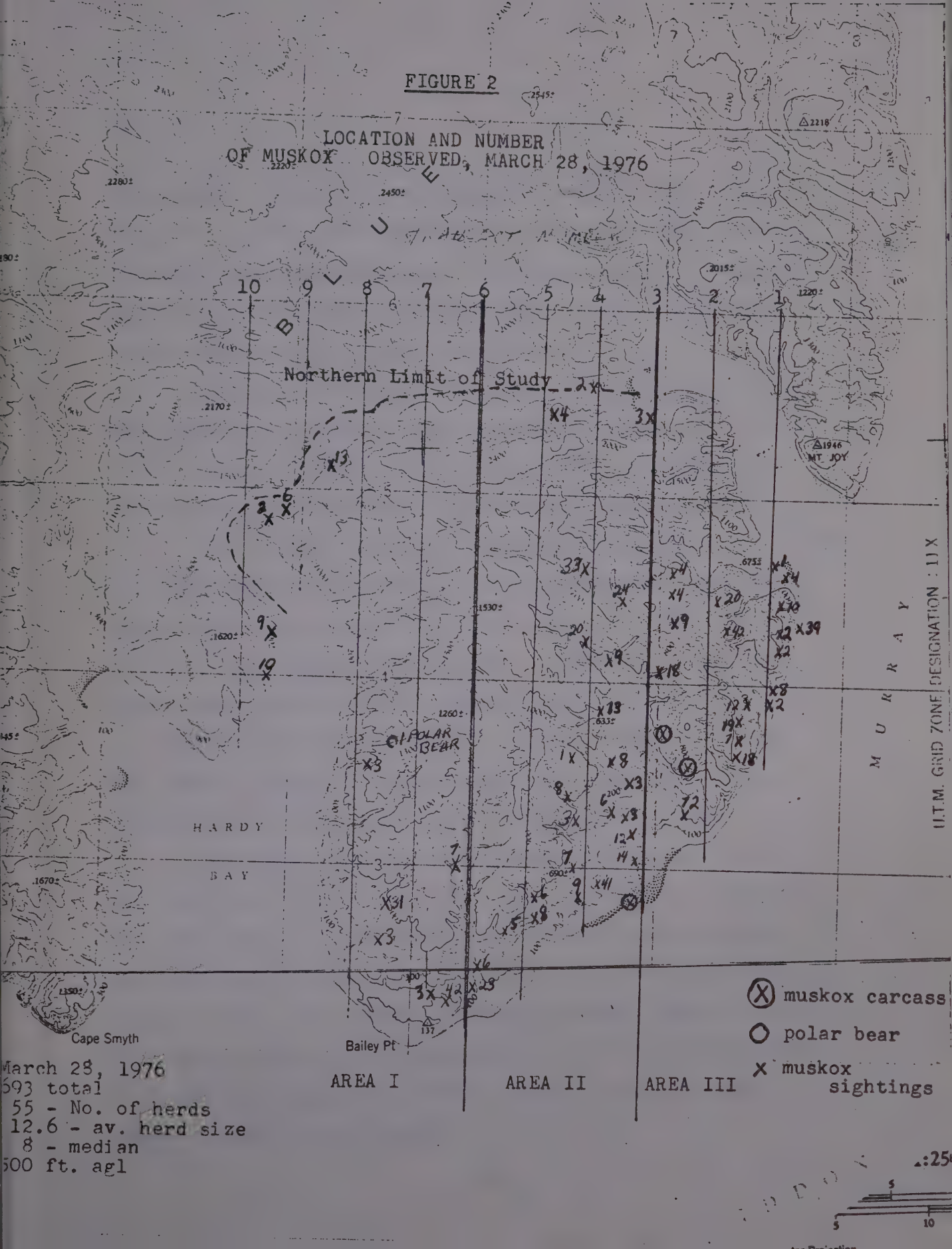


FIGURE 2
LOCATION AND NUMBER
OF MUSKOX OBSERVED, MARCH 28, 1976
BLUE
Northern Limit of Study
10
9
8
7
6
5
4
3
2
1
HARDY
BAY
MURRAY
U.T.M. GRID ZONE DESIGNATION : 11 X
POLAR BEAR
Cape Smyth
Bailey Pt
AREA I
AREA II
AREA III
muskox carcass
polar bear
muskox sightings
March 28, 1976
593 total
55 - No. of herds
12.6 - av. herd size
8 - median
500 ft. agl

and 27 muskox in 4 herds in the two adjacent transects to the west (transects 9 and 10). For comparison of the two surveys these 27 are not included in the following analysis. The location and size of each herd observed during the surveys is given in Figure 1 and 2. During both surveys weather conditions were sunny with ice fog.

There was a difference of 79 muskox in the total counts of the two surveys. The difference between the numbers of muskox counted during the two surveys may have resulted from survey error, or movement off Bailey Point as only three muskox carcasses were found on March 28.

Table 1 shows the change in distribution over zones A, B, C, and D. A distinct shift north from zone C into B is revealed and lesser shifts out of zones A and D are apparent. A chi square test yields a value of $x^2 = 91.61$. This indicates a significant difference at the 0.01 level. Table 2 shows the distributional change in the areas I, II, and III. At least 217 muskox moved out of area II: 31 west into area I, 107 east into area III, and about 79 off the study area. Again the chi square value of 88.10 indicates a difference significant at 0.01 level.

The greatest distributional changes were those out of zone C and area II both of which include the largest river valley in the study area where there was a high concentration of muskox in February and a much lower density in March. This is probably an annually occurring change in range. It is possibly prompted by increased snow cover and/or food depletion causing many of the animals to move from the valley to the north east and a few to the south west. Figures 1 and 2 indicate a general movement to high elevation.

Herd Size

Tables 3 and 4 show a marked change in herd size. There was a strong shift from herds of 11 to 20 and 21 to 30 to herds of 1 to 10 and those greater than 30. Chi square test yield values of 9.10 for Table 3 and 165.60 for Table 4 indicating that the changes are statistically significant. Factors governing herd size are not well understood but it may be assumed that the shift to smaller herds is in response to forage availability and snow cover in late winter. Small herds would not have to move to new ground as often as would large herds.

F. L. Miller and R. H. Russell (pers. comm.) have observed that several herds will merge into one large one in response to harassment by wolves. This is a possible explanation of the herd of 72 observed in March where a large area surrounding the herd was devoid of muskox though no wolves were observed.

On February 16, average herd size was 13.3 and median herd size was 13. The range was 2 to 60 plus. The average density was 269.5 muskox per 100 square miles (104.1/100 km^2). On March 28, average herd size was 12.6 while the median dropped sharply to 8. The range of herd sizes was 1 to 72 and average density was 241.0 per 100 square miles (93.1/100 km^2).

Reaction to the Survey Aircraft

On February 16th 36 herds were observed on transect. Response to the aircraft flying at 1,000 feet (305 M) agl was noted for 18 herds - 8 of which (44%) responded either by grouping (3 herds) or dispersing on the run (5 herds). The other 10 herds showed no observable response to the aircraft (D. Carruthers, pers. comm.). In March the aircraft was flown at 1500 feet (457 m) agl and the reaction though not quantified, was reduced more than would be expected for the changed altitude of the craft.

In a contemporary study on Banks Island, surveys were conducted on February 18 and March 27, 1976, both at 1500 feet (457 m) agl. (Dan Carruthers pers. comm.). Table 5 shows that on February 18 of a total of 13 herds 6 or 45.2% reacted and on March 27 of a total of 20 herds only 3 or 15.0% reacted. Weather was clear and calm during both surveys. A chi square test shows this to be a significant difference at 0.05 level. This change in response to the aircraft disturbance may be attributed to the poorer condition of the muskox. The stress of reduced energy may override the overt reactions normally associated with disturbance by aircraft.

Other Studies of the Area

D. C. Thomas et al did an aerial reconnaissance of the area on March 28, 1975, and counted 447 muskox in 22 herds. They did not fly transects but flew the coastline and the one large river valley in the south eastern portion of the study area and they did not cover Zone A. Therefore, total count and herd size can not reasonably be compared to the present data since many small, far away herds were probably missed. However, the distribution of the muskox observed is of interest. They saw the following numbers of muskox in the zones and areas designated in the present study:

	ZONES	B	C	D	AREAS	I	II	III
March 28, 1975		116	244	87		205	111	131

When these data are tested by chi square with the February and/or March data of the present study (Tables 1 and 2) a significant difference is revealed. This indicates that the winter muskox distribution on Bailey Point changes from year to year, probably according to snow depth and other climatic factors. On March 28, 1975, there was very little snow on the

area. (R. H. Russell pers. comm.)

Table 6 shows the estimated number and densities of muskox in the study area from March 1972 to August 1974 recorded by Miller and Russell. (Miller, Russell and Urquart 1973, Miller and Russell 1974, unpublished data.) The 745 muskox counted in February 1976 is the highest count for the area to date. This condition indicates either that the population is increasing or that an annual movement from the area occurs each year before March. (Miller and Russell always did their winter survey in March and April.) The latter alternative would mean that most of the muskox that leave the area return during spring, summer or fall.

The muskox on Bailey Point have been found to represent from 17.3% (Tener, 1961) and 26.3% (Miller and Russell unpublished data) of the total population of Melville Island though its area is only 2% of the total area of the island. Miller and Russell (unpublished data) also found that calf production on Bailey Point represented 15.8% and 42.0% of the total production of Melville Island in 1973 and 1974 respectively. These statistics indicate the extreme importance of Bailey Point as a potential reservoir for the island's muskox population. (Nettleship and Smith, 1975.)

Conclusions

There was significant changes in herd size and distribution between February and March of 1976. It is apparent that muskox may emigrate or migrate from Bailey Point in late winter. Winter distribution of muskox varies from month to month as well as from year to year in the study area.

This study points out the importance of control studies done prior to disturbance studies. If the seismic program had proceeded on Bailey Point as planned in February and March of 1976, the results obtained in Phase 3 of the study would very likely have caused conclusions to be drawn which could be incorrect. For instance, the movement away from the largest river valley of prime habitat mentioned earlier, and the apparent movement from the study area may well have been attributed to the disturbance caused by the seismic operations. It must be emphasized that environmental impact studies should include time for control data to be collected as well as experimental data, in order to avoid confusion.

Acknowledgements

F. L. Miller, Canadian Wildlife Service and Don Carruthers helped draw up the study plan. F. L. Miller and Anne Gunn critically read the manuscript.

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APPENDIX I

Other Mammals Spotted

One polar bear was spotted on March 28, 1976 on the west coast of the study area about 1000 feet above sea level and at the head of a stream valley (Figure 2). This bear was most likely a female with cubs in a den, about to emerge. The terrain is the type commonly used by female polar bears to den (R. Russell pers. comm.). This area should therefore be considered a potential polar bear denning site.

No caribou, wolves or foxes were observed.

TABLE 1

The change in distribution of muskox over four north-south zones (Figure 1) in the study area from February 16 to March 28, 1976.

DATE	ZONES				
	A	B	C	D	TOTAL
Feb. 16	32	112	371	230	745
Mar. 28	22	241	212	191	666

x^2 = 91.61 - significant at 0.01 level

TABLE 2

The change in distribution of muskox over three east-west areas (Figure 2) in the study area from February 16 to March 28, 1976.

DATE	AREAS			
	I	II	III	TOTAL
Feb. 16	71	488	186	745
Mar. 28	102	271	293	666

x^2 = 88.10 - significant at 0.01 level

TABLE 3

Number of muskox herds of various sizes, February 16 to March 28, 1976.

DATE	HERD SIZE				
	1-10	11-20	21-30	30	TOTAL
Feb. 16	25	20	8	3	56
Mar. 28	32	10	2	7	51

x^2 = 9.10 - significant at 0.05 level

TABLE 4

Number of muskox in various sized herds, February 16 and March 28, 1976.

DATE	HERD SIZE				
	1-10	11-20	21-30	30	TOTAL
Feb. 16	124	294	188	139	745
Mar. 28	160	159	47	300	666

x^2 = 165.60 - significant at 0.01 level

TABLE 5

The difference in reaction of muskox to the survey aircraft 1500 feet agl during flights on February 18 and March 27, 1976 on Banks Island (Dan Carruthers, pers. comm.).

DATE	REACTED	DID NOT REACT
Feb. 18	6	7
Mar. 27	3	18

x^2 = 5.76 - significant at 0.05 level

TABLE 6

A comparison of numbers and densities of muskox observed by the Canadian Wildlife Service from five aerial surveys of Bailey Point, March 1972 to August 1974 and those obtained by the present study from two aerial surveys, February 16 and March 28, 1976.

DATE	NO. OF MUSKOX		AVERAGE DENSITY/100 km^{2*}
Mar-April 1972	592		82.7
Mar-April 1973	420	est. from 25% coverage	58.7
July-August 1973	612		85.5
Mar-April 1974	648		90.5
July-August 1974	720		100.6
Feb. 16, 1976	745	100% coverage	104.1
Mar. 28, 1976	666		93.0

* assuming the area to be 715.9 square kilometers

DATE LOANED	BORROWER'S NAME	DATE DUE